

BEVER CONTROL AS

# User manual BeverPlan

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BeverWIN2010

**Version 1.0**

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## BeverPlan User Manual

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## BeverPlan

## User Manual

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# 1 BeverPlan

## 1.1 General information

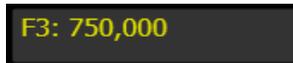
### 1.1.1 Button types



Ordinary touch button



Drop down list



Number button, brings forward the number keypad.

All buttons on the screen have a pretext. If this is F1: - F12: it's possible to use the function keys on the keyboard instead of touching the screen. CF1: - CF12: means control key and function key simultaneously.

### 1.1.2 Special buttons



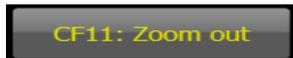
Jumps to the start screen. You find it in lower right corner in all screens.



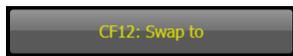
Jumps to next screen in the sequence if you are in a main screen. Jumps one level up you are in a sub menu. You find it in lower right corner in all screens.



This button appears when parameters are changed. If not pressed, the system will discard the changes.



In graphical screens it's possible to zoom in around the position where one touches the screen. To see the complete screen again press this button.



In most screens. Changing to program BeverProfiler or BeverDrill.

## 1.2 Main menu



This menu is the start menu and main menu for BeverPlan, and can always be reached by pressing F2:To start. The status information shows if the program is connected to the BeverDrill and BeverProfiler programs.

**CF1: - CF4:Go directly to menu**

On the left side are buttons for direct access to menus that are normally executed in sequence. Just to the right of these buttons are information about currently active plan data like name of the current face and navigation method. To move from one menu to the next in the sequence, press F1:Next.

**F1: and CF12: Fixed buttons**

The two buttons in the bottom of the screen are present in all menus.

- F1:Next moves to next menu in the sequence. In this case it's the Face menu.
- CF12:Swap to makes it possible to select another program

**F3:Active project**

Selects project from a dropdown list. Changes the active project in both BeverPlan and BeverProfiler.

**F4:Synchronize**

Moves planning data from the USB memory stick to the computer. The memory stick is emptied. Then moves drill and profiler logs to the memory stick. All logs are also copied to a backup folder on the computer. If drill rig is connected to Internet and no USB memory stick is connected when button is pressed, synchronize will transfer files to and from [www.bevercontrol.info](http://www.bevercontrol.info) instead.

**F5:Eject**

Always press this button before removing the USB memory stick. This finishes all write operations to the stick.

**F11:Operations**

Sub menu for deleting project, handling system data, setting time, controlling calibration of the booms and changing language.

**Web information**

The web information field show if the drill rig is connected to [www.bevercontrol.info](http://www.bevercontrol.info) and if there are any data to send or receive. The last queries from the office are also shown.

**1.2.1 Main menu -Swap to**



Changing to another program or stops BeverPlan

**F3:Drilling**  
Change to program BeverDrill.

**F4:Profiler**  
Change to program BeverProfiler.

**F7:Power off**  
Stops BeverPlan so that Windows can be started. A code has to be typed.

**F2:Cancel**  
Closing this menu.

## 1.2.2 Main menu - Operations



### F3: System

Menu for saving and restoring system data and drill parameters to and from the hard drive of the computer and a USB memory stick.

### F4: Save all

Save all important folders and files on both computers to a folder named SystemData on an USB memory stick. Zip the folder and send the file to Bever Control if there is a problem with the software or planning data on the drill rig.

### F5: Calibrate

Menu for comparing the profiler with the booms, and display the coordinates for the drill bit in rig or map reference coordinates.

### F6: Delete project

Deletes the current project.

### F7: Event log

List of events from the program like pressed buttons, navigation information and so on. Used to find errors in the program. See example below.

```

[PLAN_EVENT_LOG]
1
1000
:      1      26/05/2011 11:13:22      13:22:671 Connected to Boreterminal
:      1      26/05/2011 11:13:22      End system status
:      1      26/05/2011 11:13:22      Number of points in log: 0
:      1      26/05/2011 11:13:22      Drillplan Probe: <default>
:      1      26/05/2011 11:13:22      Drillplan Bolt: <default>
:      1      26/05/2011 11:13:22      Drillplan Inj: <default>
:      1      26/05/2011 11:13:22      Drillplan Normal: Injeksjonsplan
:      1      26/05/2011 11:13:22      Face method: 6 <unknown>
:      1      26/05/2011 11:13:22      Drilling direction: Increasing
:      1      26/05/2011 11:13:22      Face: 90 000 Rundkjøring stigende pel
:      1      26/05/2011 11:13:22      Project: 11000_Nishammern
:      1      26/05/2011 11:13:22      System status:
:      1      26/05/2011 11:13:19      Event log started...
:      1      14/03/2011 08:38:19      Event log stopped...
:      1      14/03/2011 08:34:07      B02: Choose face!
:      1      14/03/2011 08:34:07      F1: Next
:      1      14/03/2011 08:34:04      Apply finished...
:      1      14/03/2011 08:34:04      F5(Select navigation method): Relative to tunnel line
:      1      14/03/2011 08:33:36      Apply finished...
:      1      14/03/2011 08:33:36      B02.1: Edit face!
:      1      14/03/2011 08:33:36      F11: operations
:      1      14/03/2011 08:33:35      B02: Choose face!
:      1      14/03/2011 08:33:35      F1: Next
:      1      14/03/2011 08:33:32      B01: Choose project / sub project
:      1      14/03/2011 08:33:32      F2: To start
:      1      14/03/2011 08:33:30      B01.1: Select operation!

```

**F9: Select language**

It's possible to select between different languages. The system will change back to original language when power is turned off and on again.

**F10: Set date and time**

Format is year, month, date, hour and minute.

### 1.2.2.1 Main menu - Operations - System



This menu is for saving and restoring system data and drill parameters to and from the hard drive of the computer and a USB memory stick. System data are parameters like geometry parameters, scaling factors, calibration values and so on. Drifter data are drill parameter settings for the different drill parameter sets.

#### 1.2.2.1.1 System data block

##### F3:Save

Saves both system data and drill parameters to hard drive and an USB memory stick if present. For single computer system it is very important to also save to a USB memory stick. This in case the hard drive is damaged. On a system with two computers this is not so important since the current set always is in use on the left computer and the backup is stored on the right computer.

##### F4:Load

Restores system data only, from hard drive or USB memory stick.

##### F5:Delete

Used to remove old system data from the backup

#### 1.2.2.1.2 Drifter data block

##### F6:Save

Saves drill parameters only, to hard drive and USB memory stick if present.

##### F7:Load

Restores system data only, from hard drive or USB memory stick.

##### F8:Delete

Used to remove old drill parameters from the backup

#### 1.2.2.1.3 General block

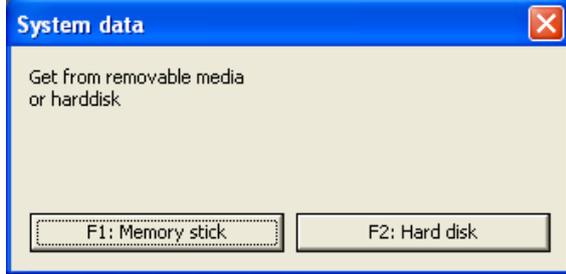
##### F9:Save system logs

Saves event logs for BeverDrill, BeverProfiler and BeverPlan to a USB memory stick.

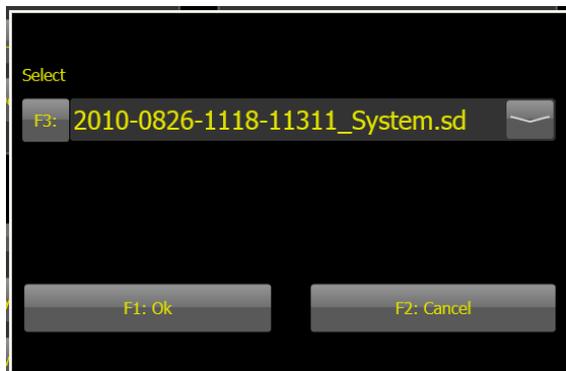
F10:Clean web outbox

For drill rigs connected to the Internet log files are uploaded to [www.bevercontrol.info](http://www.bevercontrol.info). If the connection is down for a longer period of time so that the logs adds up to more than 6Mb the transfer is cancelled. This because when the file becomes too big it's difficult to upload it from the drill rig. If this happens use this button to unzip the logs and move them to an USB memory stick with synchronize.

1.2.2.1.4 Load system data or drill parameters from backup



It's the same procedure for restoring system data and drill parameters. Restoring system data only restores data as geometry parameters, scaling factors, calibration values. Restore drilling parameters restores all parameters for the drill bits (parameter sets).

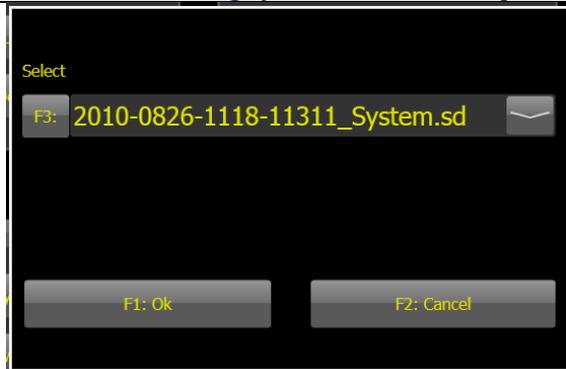


Select first where to look for backup, on the hard drive or on a USB memory stick.

The drop down list shows the newest version. Select the wanted backup version from the list.

Press F1:OK and confirm the operation in the next screen that appears.

1.2.2.1.5 Deleting system data or drill parameters from backup



It's the same procedure for deleting system data and drill parameters.

Select first where to look for backup, on the hard drive or on a USB memory stick as shown in previous chapter above.

Then mark the backup to delete, press F1:OK and confirm the deletion in the next screen that appears.

### 1.2.2.2 Main menu - Operations - Calibration



F3:Boom 1, F4:Boom 2, F5:Boom 3

Pressing one of these buttons gives the drill bit position in rig and map coordinates. Pressing F12:Apply will move the profiler to the selected position. If a mark is drilled, the boom can be moved before F12:Apply is pressed.

#### Coordinates - Local

This is the drill bit position in drill rig coordinate system. The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window. The X-axis is the calibration laser, the Y-axis is from the calibration laser and to the left and the Z-axis from calibration laser and upwards. It is possible to type values directly into these buttons.

#### Coordinates - Geo

Coordinate system for the tunnel or mine.

#### F12:Apply

When F12:Apply is pressed the geo-coordinates will be calculated from the local coordinates and the profiler will move to this point. To control the accuracy of a boom, move the boom to a mark or use the drill bit to make one. Press the boom button and move the boom to the side. Then press F12:Apply and the profiler should hit the mark.

## 1.3 Face



In the office a face is defined with name, drill direction, tunnel line and drill patterns. On the drill rig data like navigation method, current chainage value and last used drill pattern are saved for each face.

### F3:Select face

Selects a face from a list. Changes the active face in both BeverPlan and BeverProfiler.

### F11:Operations

Sub menu for selecting navigation method and other parameters for the face.

### CF1:Details

Sub menu for displaying map coordinates and camber for the tunnel line at a given chainage value.

### CF11:Zoom out

Zoom in on details by touching the graphic screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.3.1 Face - Operations

	<p><b>F3:Navigation method</b> Selects a navigation method from a list. The list can vary depending on the configuration of the system.</p> <p><b>F4:Bolt</b> This button only appears when navigation method Bolt – Trimble is selected. Sub menu for bolting rig application only.</p> <p><b>F12:Apply</b> When values are changed press F12: to save the new values.</p>
--	---

### 1.3.2 Face - Bolt

	<p><b>B02.1.1: Setup bolt face</b> Strindheim 12500</p> <p><b>Rig orientation</b> F3: <b>Increasing</b></p> <p><b>Calculation lines peg</b></p> <table border="1"> <tr> <td>Right (m)</td> <td>Up (m)</td> </tr> <tr> <td>CF2: -5,000</td> <td>CF3: 0,000</td> </tr> <tr> <td>CF4: 5,000</td> <td>CF5: 0,000</td> </tr> <tr> <td>CF6: 0,000</td> <td>CF7: 0,000</td> </tr> </table> <p><b>Rows</b></p> <p>Row distance (m) CF8: 1,200</p> <p>Feeder distance (m) CF9: 1,200</p> <p>F12: Apply</p> <p>F2: To start    F1: Next</p>	Right (m)	Up (m)	CF2: -5,000	CF3: 0,000	CF4: 5,000	CF5: 0,000	CF6: 0,000	CF7: 0,000
Right (m)	Up (m)								
CF2: -5,000	CF3: 0,000								
CF4: 5,000	CF5: 0,000								
CF6: 0,000	CF7: 0,000								

For bolting rigs there are some special settings. In the Bever Team 3 program it's possible to set direction to increasing or decreasing. When increasing is selected, hole number one is down to the left when looking in increasing chainage value direction. If set to decreasing, hole number one is down to the right. It's recommended to use increasing.

On the drill rig must be set the direction the bolting rig is positioned and the direction of moving. The direction of moving is set in the raster value screen.

**F3:Rig orientation**

Defines the orientation of the bolting rig in the tunnel.

**Calculation lines chainage, CF2: - CF7:**

Chainage value for the row distance can be calculated along three separate lines to get correct maximum distance.

In curves the row distance will be less than set value in the inner curve. Two lines are set to wall position on left and right side and will affect the row distance in curves. The third is used to tell the system the height of the tunnel and will affect the calculation when the steepness of the tunnel is changing. "Right" and "Up" refers to the tunnel line. Negative values for left side when seen in increasing chainage value direction.

CF8: Row distance(m)

Wanted maximum distance between the rows.

CF9:Feeder distance(m)

Physical distance between the feeders on the boom.

F12:Apply

When values are changed press F12: to save the new values.

CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.3.3 Face - Details

 <p>The screenshot shows a dark-themed interface. At the top, the word 'Information' is displayed in yellow. Below it, several lines of yellow text provide map coordinates: 'Chainage: 750,000', 'North (m): 7 034 931,301', 'East (m): 572 600,675', 'Up (m): 32,859', and 'Camber (%) : 5,000'. At the bottom, there is a section titled 'Enter chainage' in yellow, with a text input field containing the value 'F3: 750,000'.</p>		<p>Displays map coordinates for the tunnel line at a given chainage value.</p> <p>F5:Enter chainage Type the chainage value for the position of interest.</p>
---	--	---

## 1.4 Navigate Tunnel laser

The screenshot displays the 'Navigate Tunnel laser' interface. On the left, a 3D wireframe model of a tunnel face is shown with a laser beam and a feeder. The interface includes a control panel on the right with the following elements:

- CF1: Details** button (top right)
- B04: Position feeder in laser Strindheim 11500** (text)
- Select laser** section with **F3: 11500** (dropdown menu)
- Enter chainage** section with **F4: 300** (input field)
- F5: Boom1**, **F6: Boom2**, and **F7: Boom3** (navigation buttons)
- F8: Standard** and **F9: Reuse last** (navigation buttons)
- F11: Operations** and **F12: Apply** (action buttons)

At the bottom of the interface, there are three buttons: **CF12: Swap to**, **CF11: Zoom out**, and **F2: To start**. The status bar at the bottom left shows coordinates: North:7034540.0 m, East:-572000.0 m, Grid:10.0 m.

When navigating with tunnel laser and feeder in the laser, it's necessary to tell the system the chainage value for the front of the feeder. This is normally the chainage value of the laser hit on the face, and the feeder is positioned almost in contact with the rock to avoid bending the boom. It is possible to use another value if the feeder is retracted from the rock.

Mount the sight plates on the boom to be used to navigate with, move the sight plates into the laser beam and press the button for the boom. When this is done the F1-Next button appears and it is possible to continue. If there are no changes since last navigation, the F1-Next button appears on the screen when entering this menu

### F3:Select Laser

Select the correct laser from the drop down list. Lasers with names starting with "O-" are defined in the office and cannot be changed. Drill rig generated lasers have the prefix "J-". See operations below.

### F4:Chainage value

Type the new chainage value. See definition of chainage value above.

### F5:Boom 1, F6:Boom 2, F7:Boom 3

Navigates with this boom.

### F8:Standard

Navigates the drill rig so that the face is 12 meters straight in front of the drill rig. Used for test purpose.

### F9:Reuse last

Tells the drill rig to use its last known navigation.

### F11:Operations

Define, edit and delete drill rig generated lasers.

### F12:Apply

When values are changed press F12: to save the new values.

### CF1:Details

Coordinate transformation details for the face and drill rig. See chapter 1.5.2.

CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

## 1.5 Navigate Tunnel laser - Operations

It's possible to define up to ten lasers on the drill rig. For one face it's better to use only one laser, and just redefine it every time it's moved. When selecting new laser the system makes a copy of the active laser. This method can also be used when no laser is present. In that case measure the sight plates on the feeder directly and use these two points as laser points.

F3:Select laser

Select laser from a drop down list with lasers.

F4:New

Creates a new laser. The new one is a copy of the currently selected laser.

F5: Delete

Deletes the active laser. Lasers defined in the office can't be deleted. Confirmation request.

F6:Edit

Edits the active laser. Lasers defined in the office can't be changed but the values are displayed.

F7:Check

It's possible to use a third point on the laser, to verify that all three points are on a straight line.

CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

**1.5.1.1 Navigate Tunnel laser – Operations – Edit**



F3:, F4:, F5:  
Type the coordinates for the laser point closest to the laser.

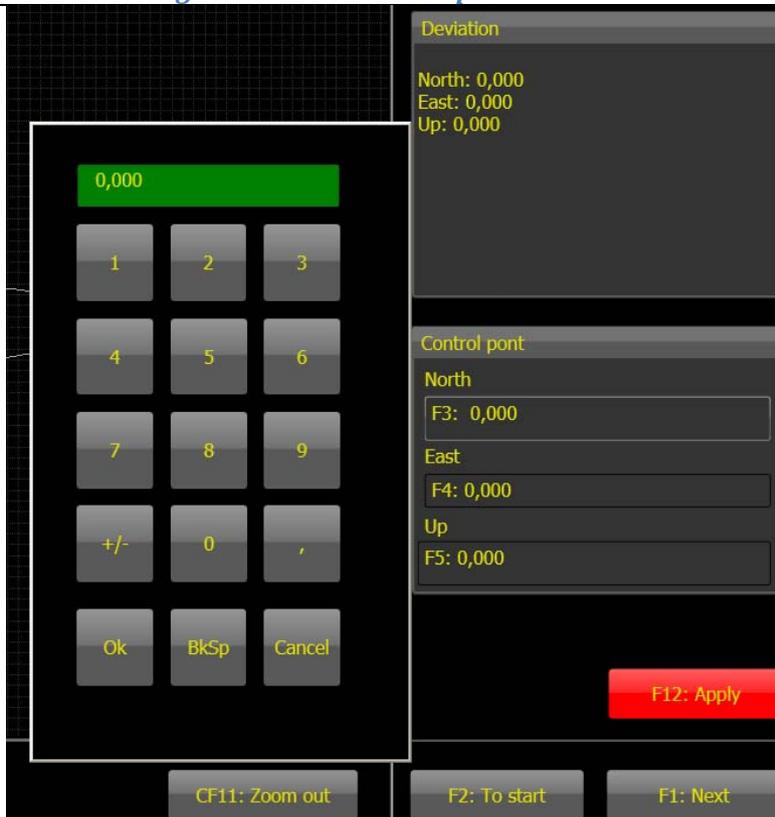
F6:, F7:, F8:  
Type the coordinates for the point closest to the face.

F9:Laser name  
The keyboard on the screen only gives numbers as possible names. Use the chainage value for the laser or the date as a name.

F12:Apply  
When values are changed press F12: to save the new values.

CF11:Zoom out  
Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

**1.5.1.2 Navigate Tunnel laser – Operations – Check**

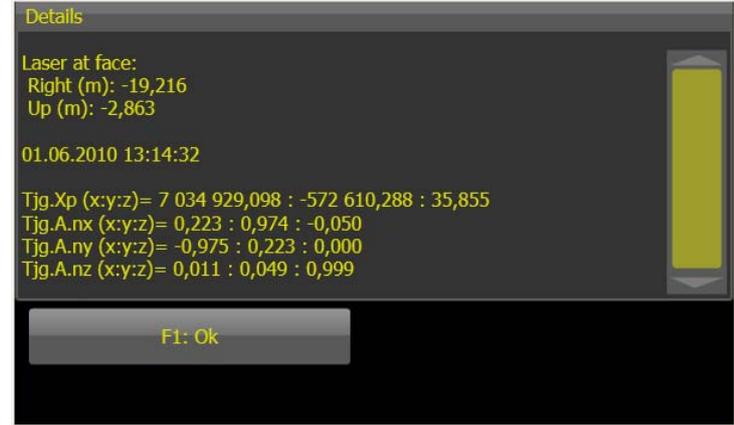


F3:, F4:, F5:  
Type the coordinates for a laser point between the two points defining the laser. The deviation from a straight line is shown in the deviation frame above.

F12:Apply  
When values are changed press F12: to save the new values.

CF11:Zoom out  
Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.5.2 Navigate Tunnel laser - Details



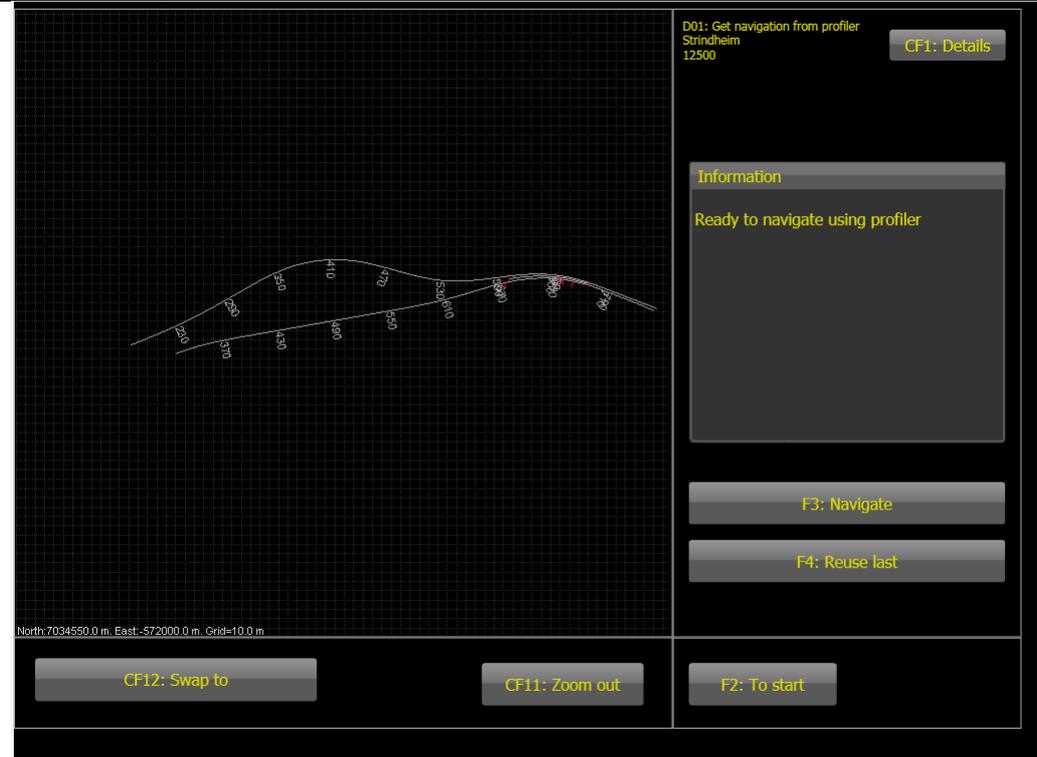
Laser at face shows the coordinates for laser hit at face with respect to the tunnel line.

Tjg is the position and orientation of the drill rig in map coordinates. Xp represents the position of the drill rig, and A.nx is the direction of the calibration laser.

The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window.

In the example to the left the drill rig is orientated almost westward (0.974) and a little to the North (0,223). Our system uses right hand coordinate system and map systems uses left hand. The Y coordinate has therefore opposite sign. Positive Y direction is west in our system.

### 1.6 Navigate Profiler



When using the profiler for navigating the drill rig, one must first navigate the profiler, then change to the BeverPlan program and choose CF2:Navigate in the main menu. Then BeverPlan connects to BeverProfiler to verify that the profiler has a navigation that's not too old. If this is the case, the button F3:Navigate appears. The F1:Next button does not appear before F5:Navigate or F4:Reuse last has been pressed.

**F3:Navigate**

Transfers the navigation from BeverProfiler to BeverPlan.

**F4: Reuse last**

Uses the last known navigation.

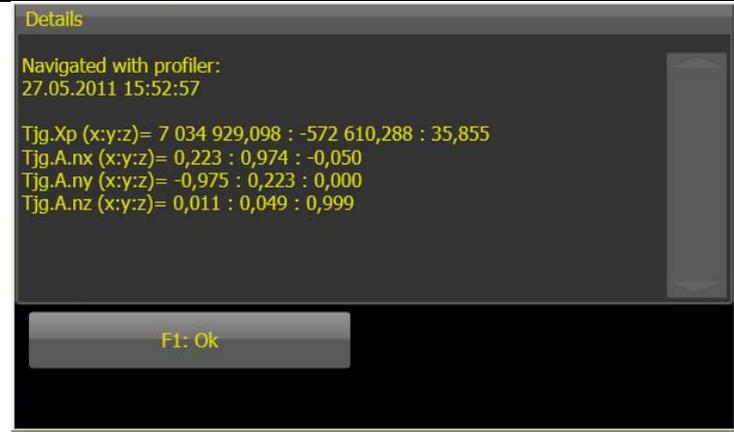
**CF1:Details**

Coordinate transformation details for the face and drill rig. See next chapter.

CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.6.1 Navigate Profiler - Details



Tjg is the position and orientation of the drill rig in map coordinates. Xp represents the position of the drill rig, and A.nx is the direction of the calibration laser. The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window. In the example to the left the drill rig is orientated almost westward (0.974) and a little to the North (0,223). Our system uses right hand coordinate system and map systems uses left hand. The Y coordinate has therefore opposite sign. Positive Y direction is west in our system.

### 1.7 Navigate Relative to line



This is a simplified laser navigation and normally used in mines only. One of the booms is positioned on a mark or known position on the face with the feeder in level. Then the distance sideways and in height with respect to the centre of the floor are typed into field F3: and F4:.

F3:Point on face: Left

Sideways distance from centre of tunnel to the navigation point. Positive to the right.

F4:Point on face: Up

Distance from the floor and up to the navigation point.

**F5: Chainage value**

Sets a chainage value. The value is used for logging only.

**F6:Boom 1, F7:Boom 2, F8:Boom 3**

Press the button for the boom used for navigation.

**F9:Reuse last**

Uses the last known navigation.

**F12:Apply**

When values are changed press F12: to save the new values.

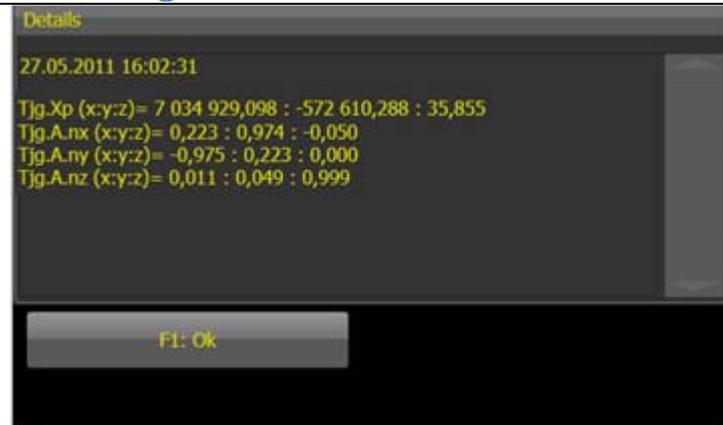
**CF1:Details**

Coordinate transformation details for the face and drill rig. See next chapter.

**CF11:Zoom out**

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

## 1.8 Navigate Relative to line - Details



Tjg is the position and orientation of the drill rig in map coordinates. Xp represents the position of the drill rig, and A.nx is the direction of the calibration laser. The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window. In the example to the left the drill rig is orientated almost westward (0.974) and a little to the North (0,223). Our system uses right hand coordinate system and map systems uses left hand. The Y coordinate has therefore opposite sign. Positive Y direction is west in our system.

## 1.9 Navigate Total station

When using a total station for navigating the drill rig the position and orientation of the total station must first be found. It is two ways to do this, both using known location called fixed points as references. These two methods are called free station and known station.

When using the known station method the total station is mounted on a fixed point and directed towards a prism on another fixed point. Free station is to mount the total station on a fixture and point it towards a prism on one fixed point and use one more prism on another fixed point to find the total stations position and orientation.

When the total station is set up and F5:Navigate is pressed, it will rotate towards the drill rig, search for and measures the positions of the two prisms on the drill rig. Then the system calculates the position and orientation of the drill rig.

### Status fields

The field up to the right shows the program system status. Uppermost line is the last one. The field down to the left shows the station status.

### F3:Free station

Sub menu to set up the total station using a fixture for the total station and two prisms on fixed points.

### F4:Known station

Sub menu to set up the total station using a fixed point for the total station and a prism on another fixed point.

### F5:Navigate

When the total station is set up, pressing this button will navigate the drill rig.

### F6:Reuse last

Uses the last known navigation.

### F11:Operations

Sub menu for defining prism positions on the drill rig, and setting parameters for the search window for the total station.

### CF1:Details

Not in use. Use CF1:Details in the estimate menus. See chapter 1.9.1.4.1 or 1.9.2.4.1.

#### CF2:Manual

To navigate the drill rig manually. Use a total station to find the positions of the prisms on the drill rig. See chapter 1.9.4. In this menu it is also possible to see the prism positions for the last navigation.

#### CF3:Shutdown

Stops all communication with the total station, restarts radio in the drill rig and the total station.

#### CF4:NoIncl

The system uses an inclinometer in the profiler that measure the inclination in the forward direction to calculate deviations in X, Y and Z direction for the drill rig navigation. If the profiler is not turned on, pressing this button makes the system finish the navigation with an inclination equal to zero. This means that the deviation in Z direction is not correct. For bolting rigs the system uses the inclinometer that measures the inclination along the rig.

#### CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.9.1 Navigate Total station - Free station

The screenshot displays the software interface for navigating a total station. On the left, a map shows a curved path with several points labeled (e.g., 84490, 84485, 84480, 84475, 84470, 84465, 84460, 84455, 84450, 84445, 84440, 84435, 84430, 84425, 84420, 84415, 84410, 84405, 84400, 84395, 84390, 84385, 84380, 84375, 84370, 84365, 84360, 84355, 84350, 84345, 84340, 84335, 84330, 84325, 84320, 84315, 84310, 84305, 84300, 84295, 84290, 84285, 84280, 84275, 84270, 84265, 84260, 84255, 84250, 84245, 84240, 84235, 84230, 84225, 84220, 84215, 84210, 84205, 84200, 84195, 84190, 84185, 84180, 84175, 84170, 84165, 84160, 84155, 84150, 84145, 84140, 84135, 84130, 84125, 84120, 84115, 84110, 84105, 84100, 84095, 84090, 84085, 84080, 84075, 84070, 84065, 84060, 84055, 84050, 84045, 84040, 84035, 84030, 84025, 84020, 84015, 84010, 84005, 84000). The map also shows a coordinate system: North: 564900.0 m, East: 40700.0 m, Grid: 100.0 m. Below the map, a command log shows: Command: -1, Command status: Ok, Command counter: -1, Target status: Unlocked, Tilt status: Off, Battery level: Unknown, Battery level: 0 %.

On the right side, there are several control panels:

- F05.2: Free station** Kristiansund Kristiansund. Buttons: CF1: Details, CF2: Goto P1, CF3: Start P2, CF4: Estimate.
- Status** panel showing Idle...
- Prism 1** section: F3: T3, Height (m) F4: 0,220.
- Prism 2** section: F5: T2, Height (m) F6: 0,210.
- Buttons: F7: Setup, F8: Extended, F11: Operations, F12: Apply (highlighted in red).
- Bottom row buttons: CF12: Swap to, CF11: Zoom out, F2: To start, F1: Next.

If the total station has been moved to a new position CF4:Estimate has to be used to tell the system the approximate position of the total station and the drill rig. See chapter 1.9.1.4 for details. The system needs this information to calculate the angles the total station has to turn when searching for prism number two and the drill rig. Short distances from the total station to the prism and drill rig demands more accurate values than long distances since the search window is defined with a horizontal and a vertical angle. The angles are set in "Navigate Total station - Operations". See chapter 1.9.3.

#### F3:Prism 1 and F5: Prism 2

Select the correct fixed points for the two prisms. The prisms must have correct identification according to the number set in F8:Extended. Prism 1 has normally id. 1 and prism 2 id. 2.

#### F4:Prism height 1 and F5: Prism height 2

Set the correct height between the fixed point and the centre of the prism for both prisms.

**F7: Setup**

Sets up the total station. The total station will measure distance and angle to both prisms and the system will then calculate the position and orientation of the total station.

**F8:Extended**

Menu for defining the identification number for prism 1 and 2, and to read the identification number of a prism when the total station is pointing at it. See chapter 1.9.1.1.

**F11:Operations**

Create, edit and delete fixed points defined on the drill rig. See chapter 1.9.1.2

**F12:Apply**

When values are changed press F12: to save the new values.

**CF1:Details**

Coordinate transformation details for the total station and the drill rig. See chapter 1.9.1.3.

**CF2:Goto P1**

If the system has found prism 1 once, it saves the position. Pressing the button makes the total station move so that it points at prism 1. This can be useful if something blocked the line of sight to prism 2 when the total station was searching for it. In that case, press this button and then F7:Setup.

**CF3: Start P2**

If prism 1 is found but there is a problem with detecting prism 2, the total station can manually be directed to prism 2 and the navigation completed by pressing this button.

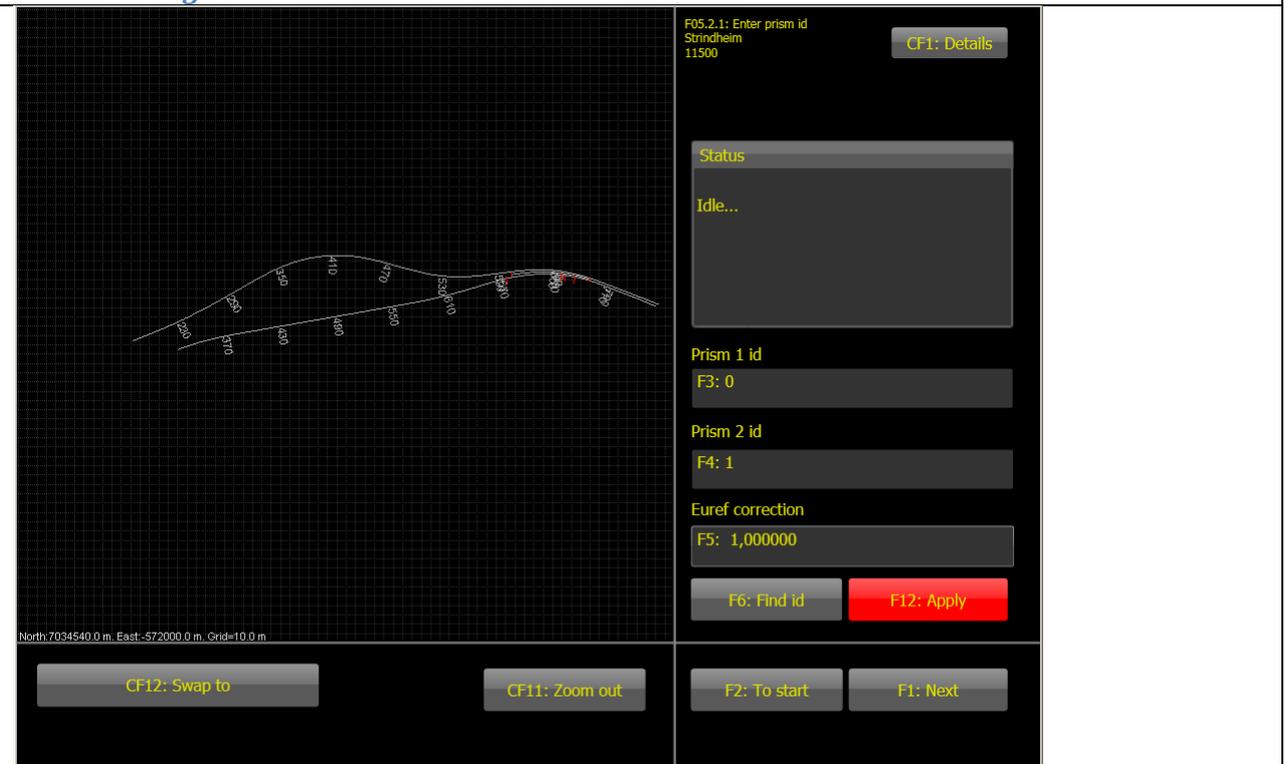
**CF4:Estimate**

The system estimates the position of the total station and drill rig based on information from the operator. Used when the total station has been moved to a new position. See chapter 1.9.1.4.

**CF11:Zoom out**

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.9.1.1 Navigate Total station - Free station - Extended



This menu is used to test a prism if the total system has problems with detecting it and to set some parameters.

F3:Prism 1 id and F4:Prism 2 id

Defines the identification number for the two prisms in the tunnel. The values are normally 1 and 2, but if there are others using similar equipment and same identification numbers, these parameters can be set to values in range 1 to 8.

F5:EUREF correction

Correction factor for map systems using the EUREF geodetic datum or geodetic datums using correction factors. For systems without correction factor this parameter is set to 1.0.

F6:Find Id

Direct the total station towards a prism, turn on the prism and when this button is pressed the system will answer with the identification number of the prism.

F12:Apply

When values are changed press F12: to save the new values.

CF1:Details

Not in use

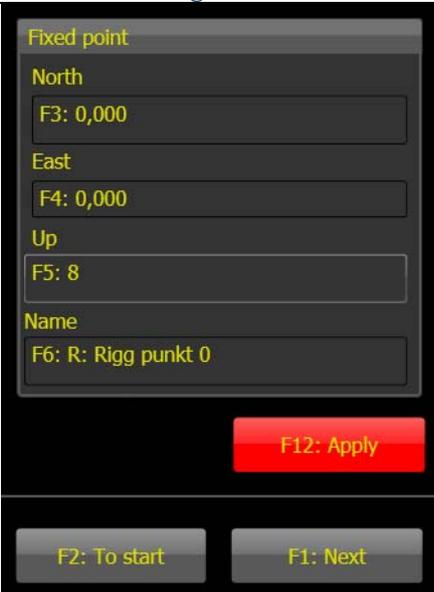
CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

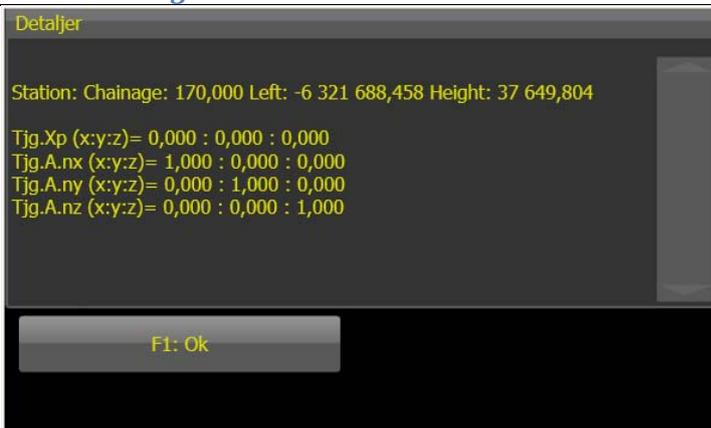
**1.9.1.2 Navigate Total station - Free station - Operations**

	<p>It's possible to define fixed points on the drill rig.</p> <p><b>F3: Select fixed point</b> Select a fixed point from a list.</p> <p><b>F4: New</b> Creates a new fixed point as a copy of the currently active fixed point.</p> <p><b>F5: Delete</b> Deletes the selected fixed point. Fixed points defined in the office can't be deleted. Confirmation.</p> <p><b>F6: Edit</b> Edits the selected fixed point. Fixed points defined in the office can't be changed but the values are displayed.</p>
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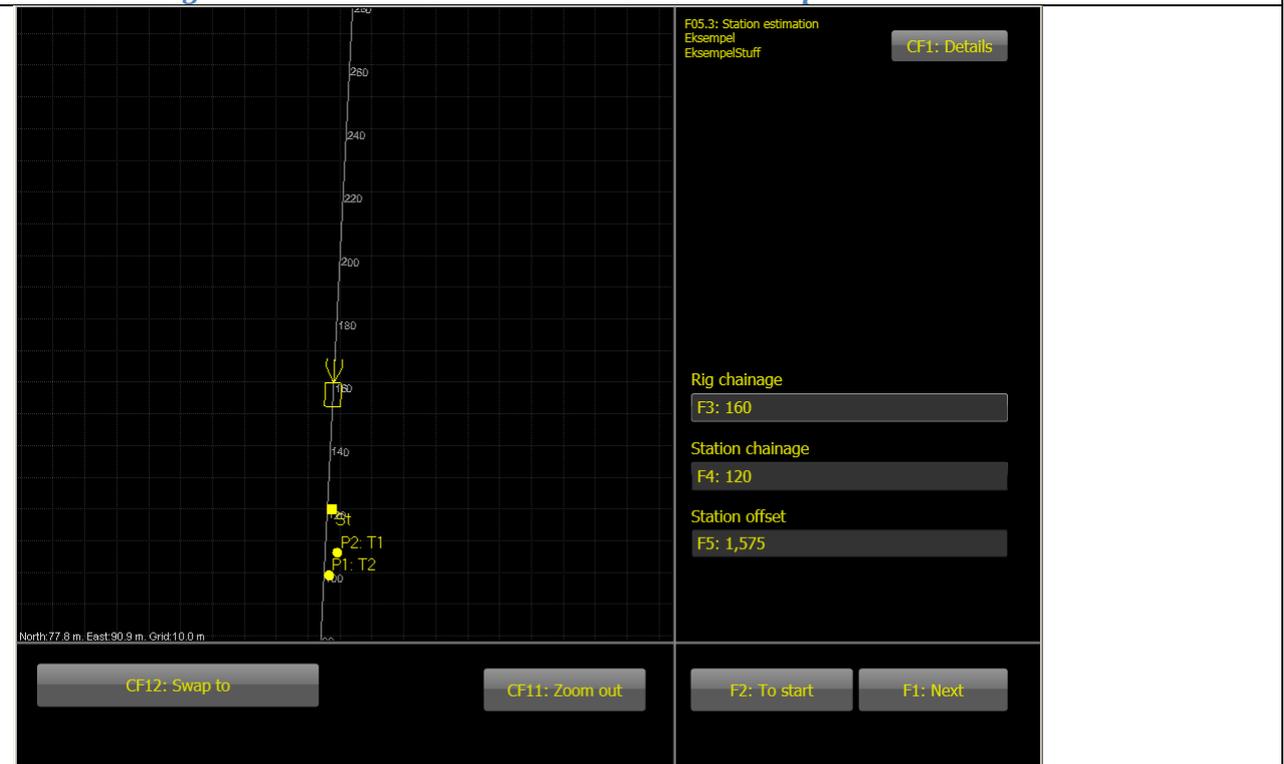
**1.9.1.2.1 Navigate Total station - Free station - Operations - Edit**

	<p><b>F3;, F4;, F5:</b> Type the coordinates for the fixed point.</p> <p><b>F6: Name</b> The keyboard on the screen only gives numbers as possible names. Use the chainage value for the fixed point or a running number.</p> <p><b>F12: Apply</b> When values are changed press F12: to save the new values.</p>
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**1.9.1.3 Navigate Total station - Free station - Details**

	<p>Shows station position relative to tunnel line and rig position in map coordinates.</p> <p>Tjg is the position and orientation of the drill rig in map coordinates. Xp represents the position of the drill rig, and A.nx is the direction of the calibration laser. The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window.</p>
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### 1.9.1.4 Navigate Total station - Free station - Estimate setup



The estimate setup function is used to tell the system the approximate position of the total station and the drill rig. The system uses this to calculate the angle to turn the total station so that it can find prism 2 and the drill rig prisms. The P1:T2 and P2:T1 marks are the prisms and when F12:Apply is pressed the mark for the drill rig and the total station (St) is shown in the estimated positions in the graphical window. Short distances from the total station to the prism and drill rig demands more accurate values than long distances since the search window is defined with a horizontal and a vertical angle.

#### F3:Rig chainage

Type the approximate chainage value for the drill rig.

#### F4: Station chainage

Type the approximate chainage value for the total station

#### F5:Station offset

Type the approximate distance from the tunnel line to the total station. A negative value means that the total station is positioned on the left side of the tunnel line seen in the increasing chainage value direction.

#### F12:Apply

The system saves the values and updates the positions in the graphical window.

#### CF1:Details

Shows the angles the total station must rotate to find prism 2 and the drill rig.

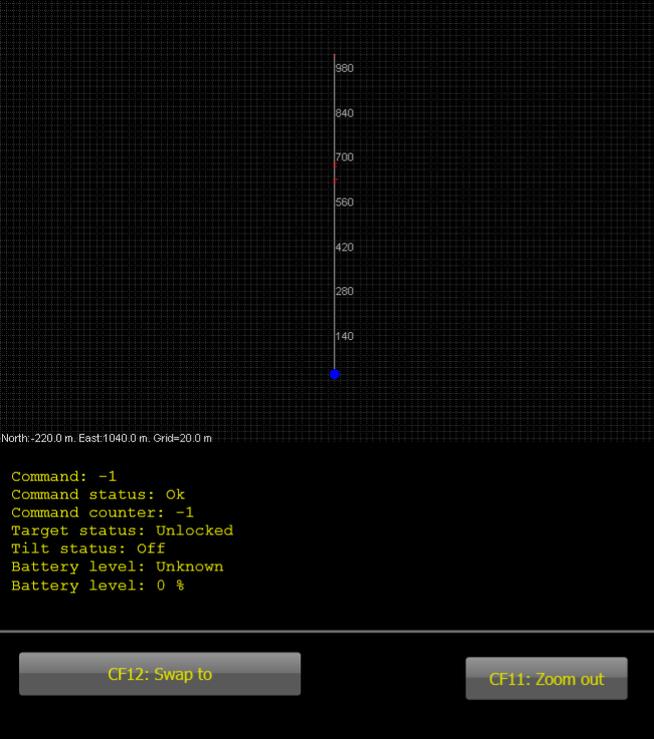
#### CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.9.1.4.1 Navigate Total station - Free station - Estimate setup - Details

	<p>Shows angle between prism 1 and 2, and between prism 1 and rig seen from the total station.</p>
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### 1.9.2 Navigate Total station - Known station

	
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If the drill rig has been moved to a new position CF4:Estimate has to be used to tell the system the approximate position. See chapter 1.9.2.4 for details. With this method it is possible to use a prism without identification. The identification for the prism must then be set to -1, and the total station directed correctly to the prism.

#### F3:Station position and F5:Aim at

Select the correct fixed points for the positions of the total station and the prism. The prism must have correct identification according to the number set in F8:Extended.

#### F4:Station height and F6:Prism height

Set the correct height between the fixed point and the centre of the total station and the same for prism 1.

#### F7:Setup

Sets up the total station. The total station will measure distance and angle to the prism and the system will calculate orientation of the total station.

#### F8:Extended

Menu for defining the identification number for prism 1 and 2, and to read the identification number of a prism when the total station is pointing at it. See chapter 1.9.2.1.

#### F11:Operations

Create, edit and delete fixed points defined on the drill rig. See chapter 1.9.2.2.

#### F12:Apply

The system saves the values and updates the positions in the graphical window.

#### CF1:Details

Coordinate transformation details for the total station and the drill rig. See chapter 1.9.2.3

#### CF2:Goto P1

If the system has found prism 1 once, it saves the position. Pressing the button makes the total station move so that it points at prism 1.

#### F4:Estimate

The system estimates the position of the drill rig based on information from the operator. Used when the drill rig has been moved to a position very different from last navigation. See chapter 1.9.2.4.

#### CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.9.2.1 Navigate Total station - Known station - Extended



This menu is used to test a prism if the total system has problems with detecting it and to set some parameters.

#### F3:Prism 1 id and F4:Prism 2 id

Defines the identification number for the two prisms in the tunnel. The values are normally 1 and 2, but if there are others using similar equipment and same identification numbers, these parameters can be set to values in range 1 to 8.

#### F5:EUREF correction

Correction factor for map systems using the EUREF geodetic datum or geodetic datums using correction factors. For systems without correction factor this parameter is set to 1.0.

F6:Find Id

Direct the total station towards a prism, turn on the prism and when this button is pressed the system will answer with the identification number of the prism.

F12:Apply

When values are changed press F12: to save the new values.

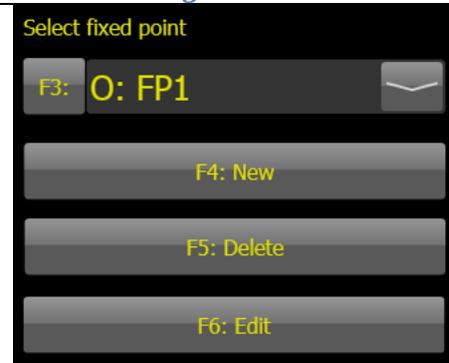
CF1:Details

Not in use

CF11:Zoom out

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.9.2.2 Navigate Total station - Known station - Operations



It's possible to define fixed points on the drill rig.

F3:Select fixed point

Select a fixed point from a list.

F4:New

Creates a new fixed point as a copy of the currently active fixed point.

F6: Delete

Deletes the selected fixed point. Fixed points defined in the office can't be deleted. Confirmation.

F11:Edit

Edits the selected fixed point. Fixed points defined in the office can't be changed but the values are displayed.

#### 1.9.2.2.1 Navigate Total station - Known station - Operations - Edit



F3:, F4:, F5:

Type the coordinates for the fixed point.

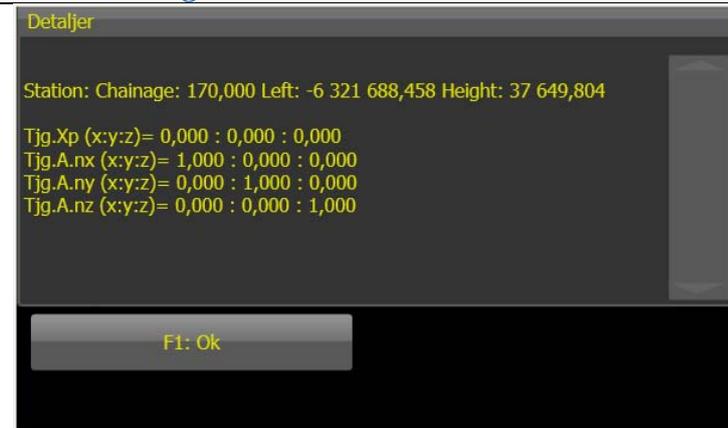
F6:Name

The keyboard on the screen only gives numbers as possible names. Use the chainage value for the fixed point or a running number.

F12:Apply

When values are changed press F12: to save the new values.

### 1.9.2.3 Navigate Total station - Known station - Details



Shows station position relative to tunnel line and rig position in map coordinates.

Tjg is the position and orientation of the drill rig in map coordinates. Xp represents the position of the drill rig, and A.nx is the direction of the calibration laser.

The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window.

### 1.9.2.4 Navigate Total station - Known station- Estimate setup



The estimate setup function is used to tell the system the approximate position of the drill rig. The system uses this to calculate the angle to turn the total station so that it can find the drill rig prisms. The P1 mark is prism 1 and the St mark is the total station. When F12:Apply is pressed the mark for the drill rig is shown in the graphical window. Short distances from the total station to the drill rig demands more accurate values than long distances since the search window is defined with a horizontal and a vertical angle.

**F3:Rig chainage**

Type the approximate chainage value for the drill rig.

**F12:Apply**

The system saves the values and updates the positions in the graphical window.

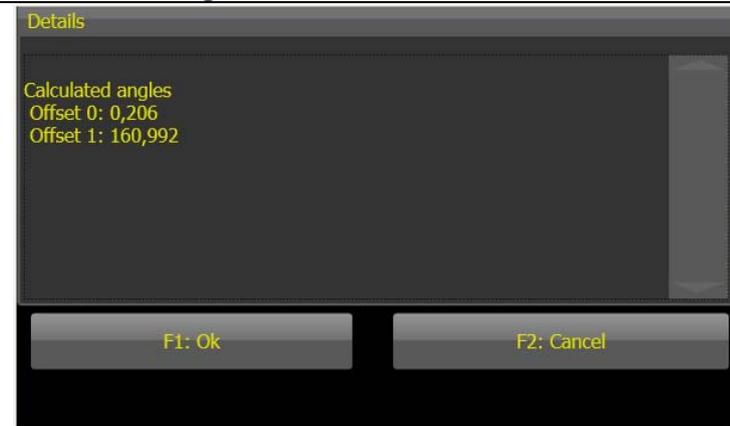
**CF1:Details**

Shows the angle the total station must rotate to find the drill rig.

**CF11:Zoom out**

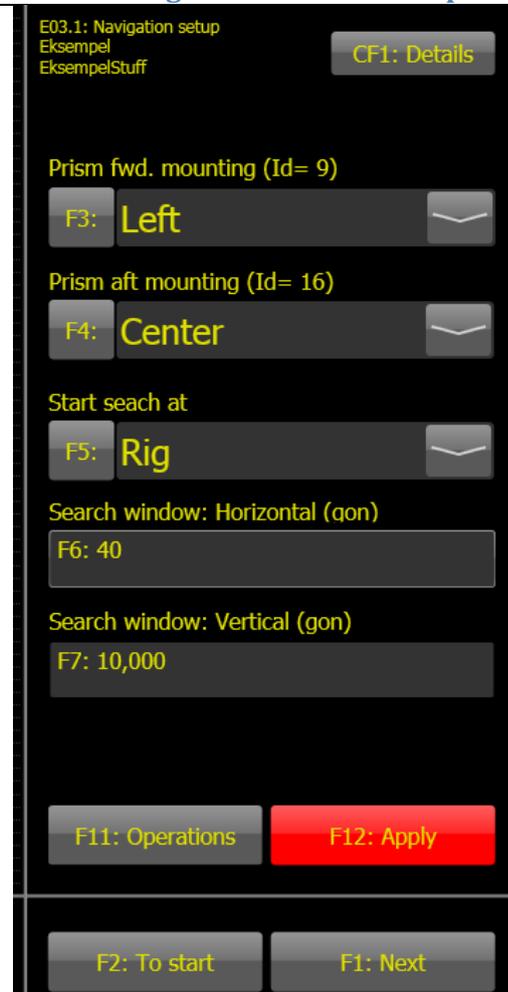
Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

### 1.9.2.4.1 Navigate Total station - Known station - Estimate setup - Details



Shows angle between between prism 1 and rig seen from the total station.

### 1.9.3 Navigate Total station - Operations



Forward there are two and backward three possible positions for prism mounting. The identification numbers for the prisms are shown in parenthesis.

It is possible to set the size of the search window for the total station horizontally and vertically.

F3:Prism fwd. mounting

Selects between left and right mounting for the forward prism.

F4: Prism aft mounting

Selects between left, centre and right mounting for the backward prism.

F5:Start search at

Only in use for ATS total station.

F6: Search window: Horizontal (gon)

Horizontal search window in goon.

F7: Search window: Vertical (gon)

Vertical search window in goon.

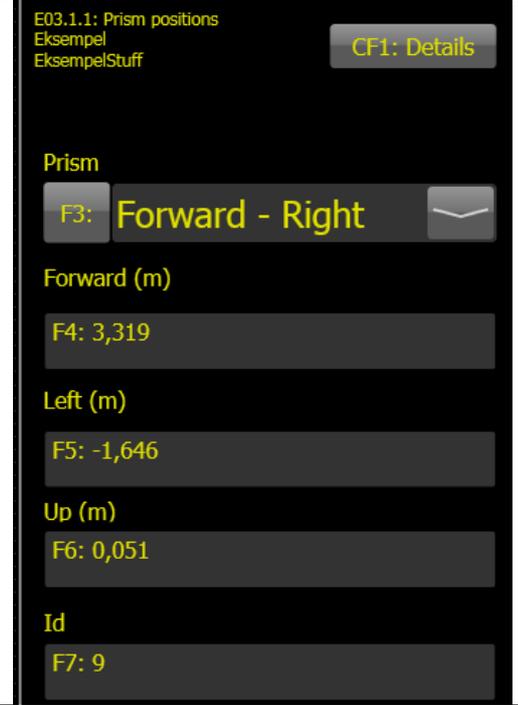
F11:Operations

For editing the prism positions.

F12:Apply

When values are changed press F12: to save the new values.

**1.9.3.1 Navigate Total station - Operations - Operations**



Prism coordinates are given in the drill rig coordinate system. The origin for the drill rig coordinate system is where the calibration laser beam comes out through the glass window. The X-axis is the calibration laser, the Y-axis is from the calibration laser and to the left and the Z-axis from calibration laser and upwards.

- F3:Prism  
Select prism for changing parameters.
- F4:Forward, F5:Left and F6:Up  
Sets the coordinates for the prism.
- F8:Id  
The identification number for the prism
- CF1:Details  
Not in use

**1.9.4 Navigate Total station - Manual**



To navigate the drill rig manually using a total station to find the positions of the prisms on the drill rig. Use a prism constant of 46mm. Type the values into the appropriate fields and press F12:Apply.

- The values shown in this window are also the values from the last navigation.
- F6:Continue  
Continues without any manual navigation
- F12:Apply  
Performs a navigation based on the numbers in fields F3: - F4:.

### 1.10 Point at face



When the drill rig is navigated it is still necessary to define the position of the face. The face is a vertical plane perpendicular to the tunnel line. It is used as reference for measuring of the hole depths when hole depth is not measured from collaring position. The chainage value for the face is the reference for the position of the log for the round. The face can be pointed out with a boom or by typing a value.

F3:Boom 1, F4:Boom 2, F5:Boom 3  
 Boom used to point out the face.

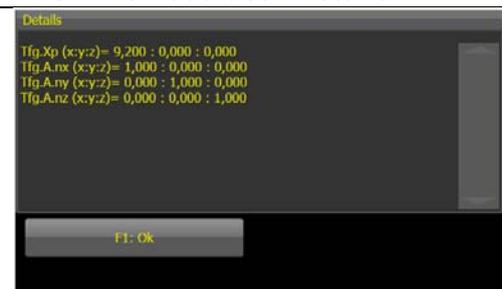
F6:Enter chainage  
 Type a chainage value for the face

F12:Apply  
 When F6:Enter chainage is used press F12: to apply the new value.

CF1:Details  
 Shows the face to map transformation. See next chapter.

CF11:Zoom out  
 Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

#### 1.10.1 Point at face - Details



Tface\_geo is the position and orientation of the face in map coordinates. The face is a plane perpendicular to the line. Xp represents the position where the tunnel line intersects the face, and A.nx is the direction of the tunnel line.

## 1.11 Message from office



It is possible to send messages from the office to the drill rig operator. The message is printed on the screen when the drill rig is inside the radius in F3:Distance to rig. The centre of the radius is the fixed point connected to the message. Example of messages are information of emergency stop telephone niche, pump station and other installations not shown in the contour or drill pattern.

### F3:Distance to rig

The radius around a fixed point. If the drill rig is inside this radius the message is shown on the screen.

### F4:Ack

The reading of the message is logged and the message removed.

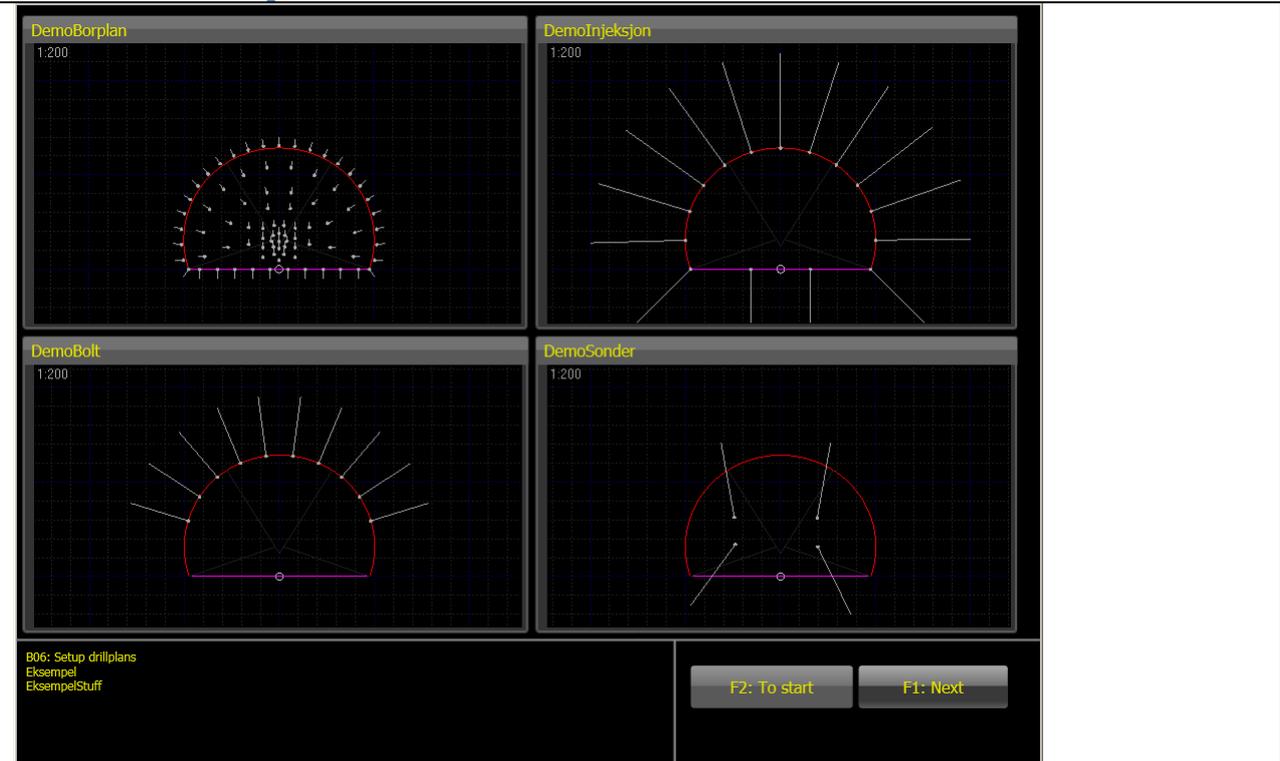
### F5:First message

Shows the first message in the list.

### F6:Next message

Shows the next message in the list

### 1.12 Select drill plans



The screen is divided into 4 areas. Upper left is normal drill plan, upper right is injection plan, lower left is bolt plan and lower right is probe plan. An empty drill plan should be selected for types not used. To change a drill plan, press somewhere inside the area for the plan.

#### 1.12.1 Select drill plans - Select drill plan



It's recommended to make separate drill plans for round, injection, bolting and probe drilling. Select correct plan to correct operation. Type of operation is defined by the four areas shown in the previous chapter. For each operation one can use parametric or non parametric drill plans. A non parametric drill plan (pretext NP:) is defined in the

office and cannot be changed on the drill rig. A parametric drill plan (pretext PA:) adjusts to the contour in the start and the bottom of the round when the face is pointed out.  
 The red contour is the contour for the reference plane and the blue contour is at a distance from the reference plane equal to the longest hole in the drill plan.

**F3:Select drill plan**

Selects a drill plan from a dropdown list.

**F4:Cut**

For parametric drill plans the operator positions the cut.

**F5:Round correction**

Makes the holes in the drill pattern shorter or longer. Keeps the lookout constant. See below.

**F6:Shift sideways round bottom**

Not in use. Moves the bottom of the holes to the side.

**F7:XY-view**

Toggles between viewing the drill pattern in normal view (YZ) and from above (XY). See below.

**F12:Apply**

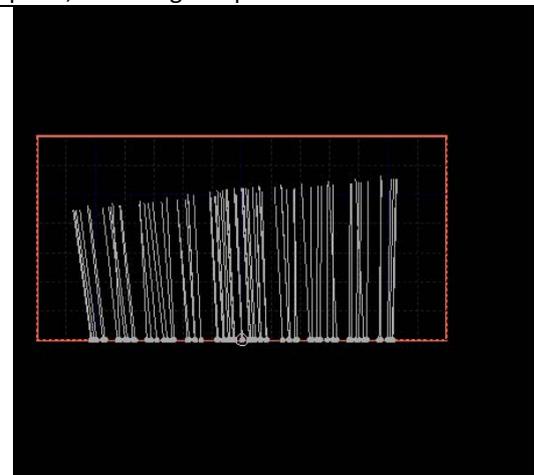
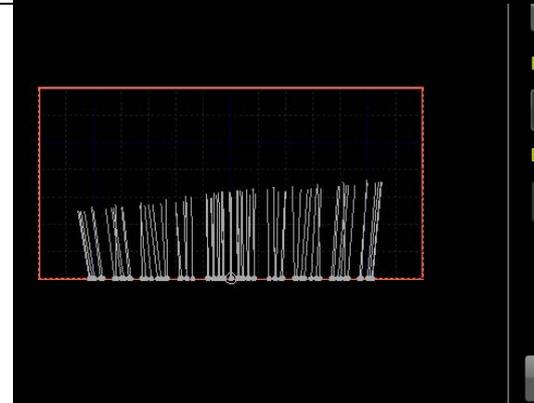
Press F12:Apply to apply the changes..

**CF1:Details**

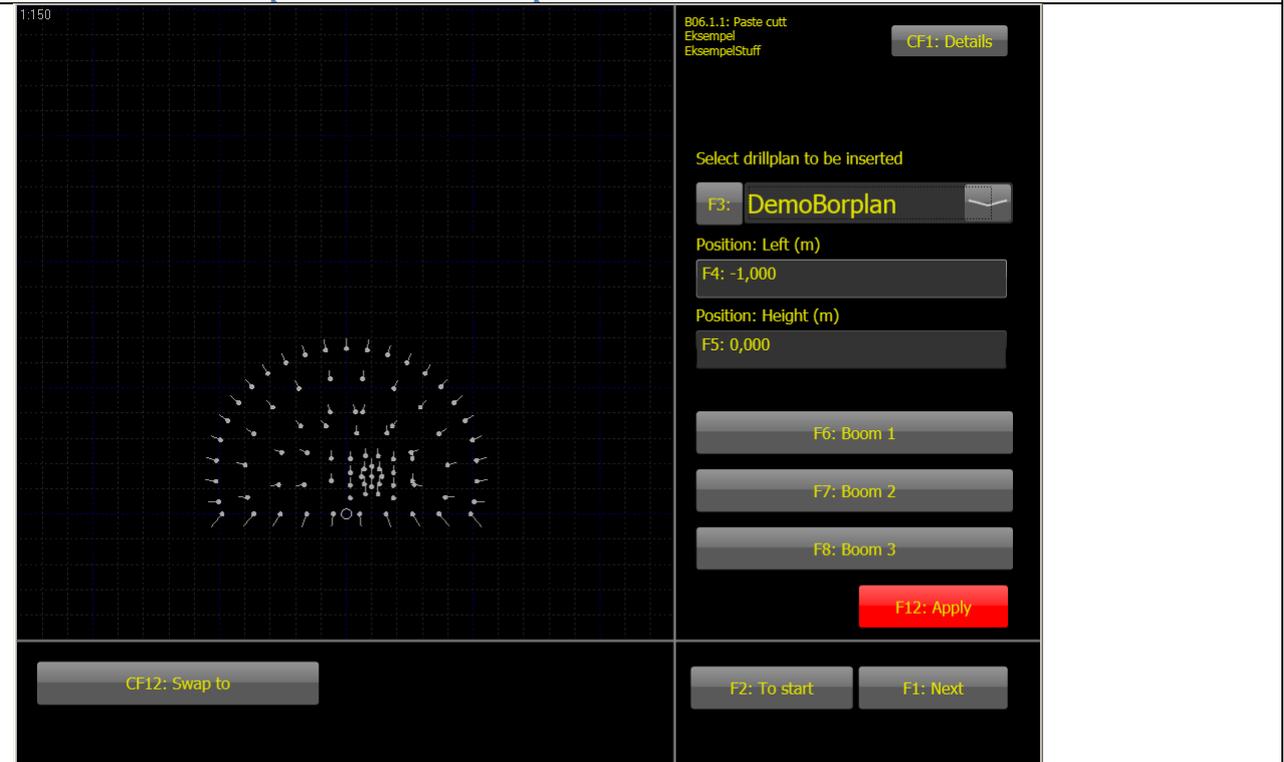
Shows the coordinates of the holes.

**CF11:Zoom out**

Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

	<p>Drill pattern seen from above with no round correction. The grid is variable.</p>
	<p>Drill pattern seen from above with a round correction of -2.0 meter. The grid is variable. Use zoom to look at details.</p>

### 1.12.1.1 Select drill plans - Choose drill plan - Insert cut



Insert cut is used in conjunction with parametric drill plans. A special drill pattern with cut and easer holes only are inserted by pointing with a boom or by typing side and height position values. There must be enough easer holes to fill the empty space inside the contour holes.

F3:Drill plan to be inserted

Select drill pattern with cut and easer holes. Used to fill out the area inside the contour holes.

F4:Position left

The sideways position of the cut

F5:Position height

The height position of the cut

F6:Boom 1, F7:Boom 2, F8:Boom 3

Boom used to point out the position of the cut.

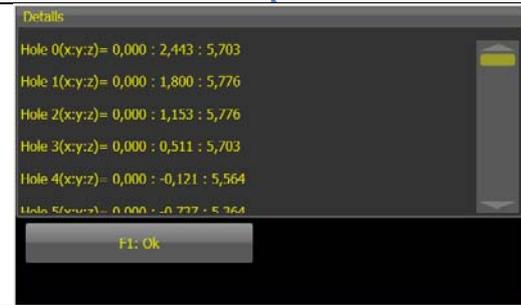
F12:Apply

The cut is inserted at the position given in F4:Position left and F5:position height.

CF11:Zoom out

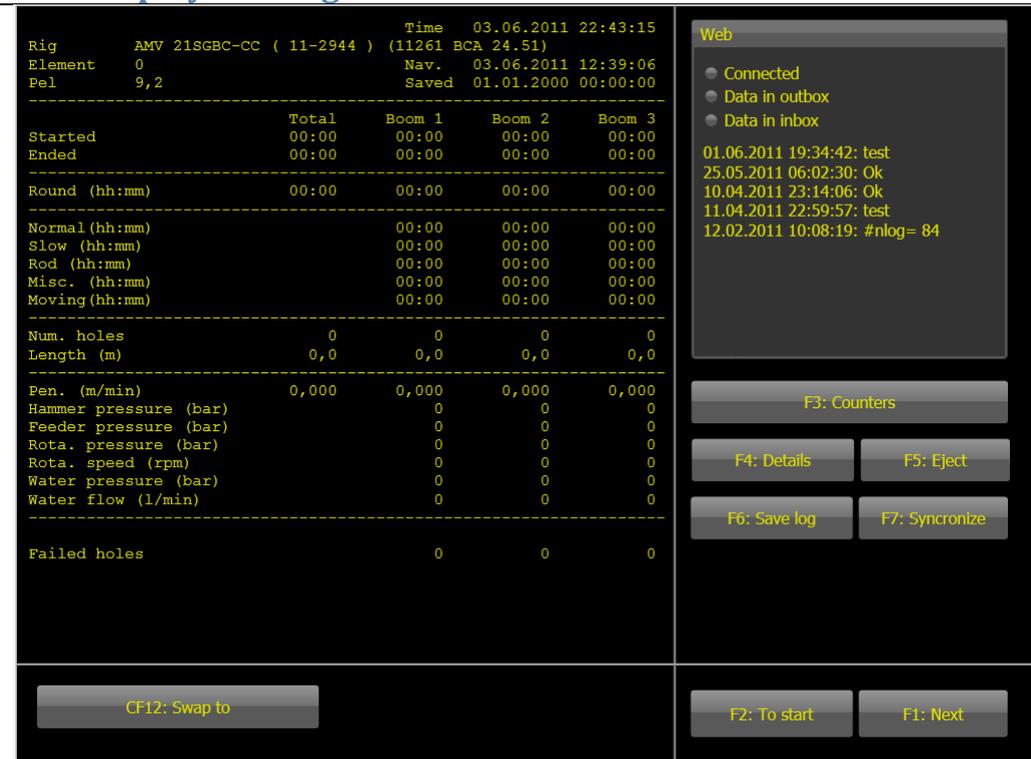
Zoom in on details by touching the screen. The system will show a zoomed in picture from the area around the hit point, and bring this point to the centre of the screen. CF11:Zoom out will show the total project again.

**1.12.1.2 Select drill plans - Choose drill plan - Details**



Shows the coordinates for the holes in the drill plan.

**1.13 Display drill log**



Shows average values for each boom for the total round. This screen is updated for each hole when finished and logged.

**F3:Counters**

Shows different counter values for drifter and hydraulic pumps. See next chapter.

**F4:Details**

Shows different types of summaries. This is the one that is relevant for drill rigs.

**F5:Eject**

Always press this button before removing the USB memory stick.

**F6:Save log**

The log is normally saved when the drill rig is navigated. If one want to bring the log for a round to the office before the drill rig is navigated again, this button can be used to save the log. Use F7:Synchronise media to move the log to the USB memory stick.

**7:Synchronize media**

Moves planning data from the USB memory stick to the computer. The memory stick is emptied. Then moves drill and profiler logs to the memory stick. All logs are also copied to a backup folder on the computer. If drill rig is

connected to Internet and no USB memory stick is connected when button is pressed, synchronize will transfer files to and from [www.bevercontrol.info](http://www.bevercontrol.info) instead.

#### Web information

The web information field show if the drill rig is connected to [www.bevercontrol.info](http://www.bevercontrol.info) and if there are any data to send or receive. The last queries from the office are also shown.

### 1.13.1 Display drill log - Counters



Shows counter values for the drifter and hydraulic pump. Values shown can vary from drill rig to drill rig.